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Little House in the Mountains? A small Mesolithic structure from the Cairngorm Mountains, Scotland

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Abstract

This paper describes a small Mesolithic structure from the Cairngorm Mountains, Scotland. Excavations at Caochanan Ruadha identified a small oval structure (c. 3m x 2.2m) with a central fire setting, in an upland valley (c.540 m asl). The site was occupied at c. 8200 cal BP and demonstrates hunter-gatherer use of the uplands during a period of significant climatic deterioration. The interpretation of the structure is primarily based on the distribution of the lithic assemblage, as the heavily podsolised soils have left no trace of light structural features. The lithic assemblage is specialised, dominated by microlith fragments, and functional analysis has identified different uses of different areas inside the structure. The identification of small, specialised Mesolithic sites is unusual and this paper will discuss the evidence for the presence of the structure and its use, compare it to other Mesolithic structures in Britain and highlight some methodological implications.

1. Introduction

This paper presents a small Mesolithic structure from Caochanan Ruadha, in the Geldie Burn valley, southern Cairngorm Mountains, Scotland. Analysis is ongoing, but there is compelling evidence for the presence of a small structure associated with a potentially very short term and quite task-specific set of activities. Such sites are rare and contribute significantly to our understanding of broader patterns of Mesolithic activity (Marchand and Goffic 2009). We present the background to the project, summarise methods and results of fieldwork at Caochanan Ruadha and detail the interpretation of the structure, before providing a comparative analysis and discussion.

2. The Upper Dee Tributaries Project and the Cairngorm Landscape

The increased use of mountain and upland landscapes has been argued to be a 'defining characteristic' of the Mesolithic in Europe (Bailey 2008, 357), but the challenges to systematic archaeological research in upland landscapes are considerable and the record of human exploitation of these areas is variable. The character of human use of uplands and mountain landscapes is unclear in many areas and significant questions remain about the motivations for the presence of hunter-gatherer communities in mountain and upland areas.

This paper presents results of one aspect of the first phase of the Upper Dee Tributaries Project (UDTP, 2012 to present), an interdisciplinary examination of the early prehistory of the National Trust for Scotland's (NTS) Mar Lodge Estate, an area of c. 29,400 hectares within the Cairngorms (Figure 1). The Cairngorms are the largest area of high ground in Britain, with several summits above 1200m asl. Conditions on the montane plateau and in the high valleys can be extreme. The plateau is dissected by river valleys, with the River Dee and its major tributaries dominating the Mar Lodge Estate. The larger valleys which are the focus of our project are not high altitude in an absolute sense, but they are remote upland environments. The area is mainly managed for conservation and outdoor recreation. Long-distance routes cross the Cairngorms, including the Lairig Ghru, Scotland's best-known mountain pass, which connects the northern and southern flanks.

Figure 1: location map showing key sites mentioned in text. Boundary in black marks edge of Mar Lodge Estate

Nothing was known of the early prehistory of the Cairngorms until the discovery during footpath maintenance between 2003 and 2006 of flint artefacts from Chest of Dee, Caochanan Ruadha and Carn Fiaclach Beag. The need to better understand these assemblages became compelling by 2012 in the context of an extensive nature conservation programme of woodland expansion on the Mar Lodge Estate, including riparian tree-planting. This has significant implications for archaeological conservation, given the fact that all these sites are buried under peat. The UDTP aims to investigate the nature, location and sequence of prehistoric inhabitation in its environmental context, and to address archaeological conservation management. It includes archaeologists, geomorphologists and palaeoenvironmentalists.

The archaeological work has primarily focused on two of the sites originally identified during footpath maintenance (Chest of Dee and Caochanan Ruadha) with further survey work seeking to identify new sites (eg Sgòr an Eòin). Work at the Chest of Dee (directed by Gordon Noble) has demonstrated a concentration of activity at c. 415m asl near prominent waterfalls, immediately above a major river confluence. Pits, hearths and occupation surfaces have been identified, with radiocarbon dates ranging from the Mesolithic to Bronze Age. No clear evidence for structures has been identified to date.

Caochanan Ruadha lies further into the Cairngorms, with radiocarbon dates focusing on c. 8200 cal BP, contemporary with one phase of activity at Chest of Dee. Caochanan Ruadha lies within a wide and shallow upland valley on the south-facing flank of the Cairngorm plateau, at c 540m asl. The Geldie Burn is a low-gradient gravel-rich river which meanders through an incised valley cut into superficial deposits and peat, but which is prone to snow-melt floods. To the east of the site is a prominent north-south morainic ridge running down to the valley floor, forming the eastern limit of a notable basin (Figure 2). To the west a large, multi-phase alluvial fan, last active after c. 500 AD, may have truncated some archaeological features. Today the site overlooks the Geldie Burn (Figure 3) but there may have been no substantial watercourse present in the Early Holocene, the site instead overlooking a peaty wetland. This is a remote and cold place today, which is routinely covered by snow in winter until at least March.

The first stage of this project was the completion of a geomorphological survey to provide overall landscape context and guide archaeological investigations by identifying land surfaces that would have formed part of the Mesolithic landscape. The Geldie valley is a well-known example of river capture, with much of the upper catchment now part of the River Feshie to the west; this probably occurred during deglaciation of the last ice sheet but may have occurred much earlier (Sissons 1967). Evidence of former glaciers is testified by numerous mounds and channels found in the vicinity of the site (Fig. 2) reflecting the retreat of a diminishing glacier in the lower part of the valley during deglaciation with the landscape being ice-free before 15,000 years ago. Valley glaciers appear to have continued to exist in some of the higher Cairngorm valleys at this time (Everest and Kubik 2006). Following deglaciation, restricted valley glaciers became re-established in the high Cairngorms: a more extensive plateau icecap covered the high Gaick Plateau to the south, with a major outlet glacier occupying the upper Geldie catchment. During deglaciation and the subsequent cold stage, non-glaciated surfaces were subjected to intense periglacial processes (Sugden 1971). This had a major impact on slopes and fluvial systems leading to the formation of thick drift sequences associated with solifluction on slopes and alluvial fans (Ballantyne and Whittington 1999). The periglacial environment influenced the river regime, with a distinct flow associated with seasonal snow and ice melt from Younger Dryas glaciers in the upper Geldie catchment. The disappearance of ice in the upper catchment appears to have had a major impact on the Geldie in the early Holocene – a major reduction in discharge and stream power allowed thick peat (3m) to form over the floodplain from at least c. 10000 cal BP. Gravel-rich bars and floodplains have only partly removed this peat cover within the last c. 2,000 years.

The closest pollen record is c. 1 km downstream at Geldie Lodge (510 m asl) (Paterson 2011). This peat stratigraphy commences at c. 7550 cal BP, and is thus slightly younger than the archaeological evidence. The earliest evidence at Geldie Lodge is for a semi-open pine woodland with birch. Heather (*Calluna*) and grasses were also important on the valley side mineral soils. Evidence of disturbance and elevated microscopic charcoal values in this woodland may indicate deliberate human modification during the later Mesolithic (Paterson 2011, 214). Over the following millennia the wood fluctuated in density. The implications for Caochanan Ruadha are that the site was likely located in semi-open woodland, towards the tree line. Pine and probably birch were present, along with open ground on slopes and the valley floor.

Full analysis of the results of the first phase of UDTP work is ongoing, and the remainder of this paper focuses specifically on the fieldwork conducted at Caochanan Ruadha.

3. Fieldwork at Caochanan Ruadha

Fieldwork took place from 2013-2015 and included geophysical survey, test- and shovel-pit survey, walkover survey and targeted excavation. This uncovered a very low-density scatter of worked flint covering an area c. 50 x 25 m. Artefacts were identified by surface survey in erosive contexts up to 380 m upstream. Identifying concentrations of activity is difficult in such a low density scatter, but two have been excavated. Trench Four (2014-2015) focused on the area of a 1.0 x 0.5 m test-pit that returned four artefacts in 2013 (no other test-pit identified more than one artefact). Some 50m downslope of Trench Four, Trench Five (2015) targeted the area of the original surface finds discovered eroding from a footpath in 2005.

Figure 2: View across Geldie Burn to Caochanan Ruadha (red arrow) looking N.

Figure 3: View looking S, location of Trench 4 visible to left, Trench 5 in centre-left

All trenches and test pits had very similar soil profiles: peat-rich A horizons overlying fine silt-sands and/or glacial diamict. The peats varied considerably in depth and could be as thin as 0.02 m. These peats overlie heavily podsolised fine sands varying from c. 0.01-0.15m depth (C.402, C.502), mainly very dark greyish brown (10YR3\2) in colour. This overlies a variable diamict of abundant sub-rounded and sub-angular clasts of local lithologies, from <0.05 m to >1 m in maximum dimension (C.414, C.503). Preliminary analyses by Clare Wilson suggest that the fine sands are an eluviated E horizon of a classic peaty podsol with illuviated Bh and Bs horizons below. These have formed through the removal of organic material, Fe and Al oxides from the E horizon and their deposition within the upper layers of the diamict. The profiles are best interpreted as *in situ* soils developed through pedogenesis and with no evidence of truncation. The extent of podsolization meant that identification of archaeological features could be very challenging. Artefacts were found throughout the sands, especially at the upper levels; in places artefacts were recovered immediately beneath the root mat and lying on top of large boulders. Although refitting has not yet been undertaken, the spatial patterning identified in the lithic assemblage strongly suggests that the assemblages are largely *in situ*.

Excavations at Caochanan Ruadha were carried out entirely by hand. Trenches were divided into 1.0 m squares and excavated in c.0.05 m spits. Control samples were recovered for flotation processing from all squares/spits with targeted sampling of features. All spoil on site was dry sieved to 5mm, but the vast majority of artefacts were recovered by hand not in the sieve and were located in three dimensions (103 of 109 from Trench 4, not including those sieved in laboratory conditions). The average size of these artefacts was 8.7mm x 4.8mm (n=109). All artefacts are flint, which is non-local. Quartz was present on site, and due to the complexities of identifying worked quartz all natural and potentially worked quartz was retained. This was assessed by Killian Driscoll using an analytical framework developed for quartz (Driscoll 2011): of the c. 4,000 pieces assessed only c. 50 are possible flakes or cores with no certain flakes/blades or retouched pieces. The discussion here therefore focuses on flint. The primary focus here is Trench Four, but brief comparative data on Trench Five are presented first to facilitate comparison.

Trench Five

Trench Five was 2.0 x 2.0 m, bisected by a heavily eroded footpath, which cut through peat (C.501) and sands (C.502) onto diamict (C.503). A total of 16 flint artefacts were recovered, mainly from C.502. Three were identified on the surface prior to excavation and four/five of the thirteen from the trench are a single burnt artefact that can be refitted. Three irregular charcoal spreads were identified at the base of C.502 and within those deposits (Figure 4). C.504 is the largest of these, covering a sub-circular area of c. 0.80 x 0.80m and c 4-20mm in maximum depth.

Two radiocarbon dates were obtained on short-lived material from C.504). Paterson thinks that *Alnus* (alder) was unlikely to have been common in upper Geldie Burn. The two dates from Trench

Five combine to 8023-7958 cal BP (95% confidence; χ^2 test: df=1; T=2.0(5% 3.8)), using the R_combine function in OxCal 4.2 (https://c14.arch.ox.ac.uk/oxcal/).

Figure 4: GLD15, Tr 5. Mid Excavation, showing C.504, 505 & 506. C. 503 underlying. Cross-hatching indicates main concentrations of charcoal. Red diamonds are flint artefacts. Refitting cluster SF507-510 in SW corner.

Table 1: Caochanan Ruadha: C14 determinations

4. A Mesolithic structure in Trench Four

Trench Four examined a 7.0 x 7.0m area immediately northeast of an eroded footpath, and with a small extension to the southwest of that footpath (Figure 5). No artefacts were recovered from the extension.

Artefacts were recovered throughout a heavily podsolised fine silt-sand. Only one archaeological feature was identified, an irregular pit/hollow associated with a concentration of charcoal and many burnt lithics (C.406) (Figure 6**),** interpreted as a fire setting**.** Two radiocarbon dates have been obtained from this feature (Table 1), both on twigs of yew (*Taxus)*. The presence of yew is interesting, given ambiguity over its natural presence in Scotland (Dickson 1993). It may be that this was carried to the site. The two dates from Trench Four combine to 8161-8011 cal BP (χ^2 test: df=1; T=0.0(5% 3.8)).

Attempts to combine all four dates in Table 1 fail (χ^2 test: df=3; T=8.3(5% 7.8)). Modelling of interval between the combined dates for Trenches Four and Five (see Supplementary Information) indicates that, while there is a small probability that they were partly contemporary, it is much more probable that the activities represented were separated by at least some decades, possibly by as much as c. 165 years (-8 to 164 years, 95.4% confidence), though more likely no more than a century or so (-4 to 87 years, 68.2% confidence) (Figure S2).

Figure 5: GLD15, Tr.4 & Tr. 4 ext. Post excavation plan. C.414 visible throughout trench. Fire setting C406/407 highlighted in tan. Test pits in pink

Figure 6: GLD14, post excavation view of pit C.406/407. Looking SW.

4.1. Distribution

A total of 109 flint artefacts were recovered by hand from the excavations and 23 from samples of the fire setting. All distribution maps that follow include only those with individual locations plotted by dGPS or total station and thus minimise the density of the centre of the concentration, but given that these samples include many very small artefacts, the focus on hand recovered material means that comparable recovery techniques are being represented. The distribution of all flint has a notable concentration in the centre associated with the fire-setting C.406 (Figure 7). There is a sudden fall off in lithic density demarcating an oval area c 3 x 2.2 m with the long axis running approximately east-west (Figure 8): this shape does not correspond to the alignment of grid squares and is not an artefact of excavation methodologies. Indeed, in some places, especially to the north, it appears that the artefact distribution is defining a coherent oval edge. Burnt artefacts are very common (74% of flint where it could be determined). Their distribution is similar to the overall pattern although they are less common outside the possible structure. Experimental work has shown that burnt flint is associated with high degrees of fragmentation (Sergant et al. 2006) and that heavily burnt artefacts are found within the hearth and smaller chips and ‘pot lid’ thermally fractured material expelled c. 2.5-3 m from the hearth. This does not correspond to the distribution identified at Caochanan Ruadha, especially in terms of the comparatively coherent and sudden limit to the distribution.

Considerable attention was paid in the field to the possibility of tent rings and/or areas cleared of stone, but no certain instances of either were identified. Given the location of the artefacts at the upper levels of C.402 any such evidence may have lain very close to the surface.

Figure 7: GLD15, Tr. 4. Mid excavation plan (bottom of Spit 2 of C.402) showing all flint finds.

Figure 8: GLD15, Tr. 4. Mid excavation plan (bottom of Spit 2 of C.402) showing all flint finds and possible structure.

The overall distribution of artefacts therefore strongly suggests the presence of an oval structure. This is most likely to have been some kind of tent or other comparatively light structure: perhaps covered in skin, bark or vegetation. This is likely to have been comparatively light weight in terms of structural framework – the only structural features that may have left archaeological traces may have been stake holes or stones used to weigh it down. Given the extent of podsolization and the highly irregular till, it is very unlikely that such ephemeral archaeological features would be identified. We therefore think it most likely that the three dimensional recording of hand recovered artefacts, including those of very small size, provides robust evidence for the presence of a small Mesolithic structure at Caochanan Ruadha. Analysis of the lithic assemblage sheds further light on the function of this building and the character of the associated activity.

4.2. Lithic Assemblage: technology

A total of 132 flint artefacts were recovered from Trench Four by hand and from samples of the central fire setting. Much of the assemblage is very small: 52 artefacts are less than 5mm in maximum dimension and 30 only 1mm. Full analysis is ongoing. 130 are blades or flakes and two are debris or indeterminate forms. No cores or core fragments are present but a core rejuvenation flake suggests some *in situ* use of cores (GLD15-SF-0419). Breakages are present on 72 of the 94 artefacts where it could be assessed (76.5%). Blades and blade fragments are very frequent (43.8% of debitage) with many fragments being too small to securely identify as either blades or flakes (46.9% of debitage). Blade widths are generally narrow, although only four complete, unmodified blades are present. The assemblage is dominated by tertiary (94%) and secondary (6%) pieces: cortex is very rare. The nearest flint sources are the coasts: as the crow flies, either c.90 km east to the North Sea coast at Aberdeen or c.70km north to the Moray Firth (Wickham-Jones and Collins 1978). As noted above, whilst it was not possible to identify evidence for burning on many small artefacts, 74.4% of artefacts that could be assessed were burnt to varying degrees. Thirty-eight artefacts are retouched: eight complete microliths, 22 microlith fragments, two possible microlith fragments, five microburins and one edge retouched blade. No scrapers are present but a possible scraper rejuvenation flake is. Microlith types are classic later Mesolithic ‘narrow blade’ forms (Figure 9), including scalene triangles, backed bladelets and crescents, with many being too small to closely classify. The three microliths found outside of the structure were all indeterminate forms, with all of the others clustering in the structure and in the central fire setting.

Figure 9: a sample of microliths, mainly broken, recovered from Caochanan Ruadha

Figure 10: possible trace of resin on SF0306

The high degree of fragmentation, high numbers of microliths, presence of microburins and evidence for burning is coherent with ‘re-tooling’: removing microlithic components of compound artefacts and replacing them, potentially using light heat to release resins. A small black patch of possible resin is present on microlith fragment SF0306 (Figure 10). The presence of core rejuvenation evidence, but not cores, and possible scraper rejuvenation, but no scrapers, demonstrates the importance of curation of artefacts in whatever strategy of landscape use is represented at Caochanan Ruadha.

Although the assemblage from Trench Five is small, which makes robust comparisons difficult, it is notable that it appears to be different in character to that from Trench Four. Trench Five’s 16 artefacts include seven flakes/fragments of flakes, five blades/fragments of blades. Retouched pieces comprise one microlith, one fragmented scraper, a possible edge retouched flake and a possible microburin.

4.3. Lithic assemblage: Functional analysis

Following an initial technical analysis by Graeme Warren the flint artefacts from Trench Four were sent to Annemieke Verbaas (Leiden Laboratory for Material Culture Studies) to assess their potential for use-wear analysis (for full report, see Supplementary Information 3). This identified thirty two artefacts as having good potential, based on surface preservation, with many of the other artefacts having been altered by light surface abrasion, probably caused by the sandy sediments in which they were deposited. The extent of burning also limited inferences in some cases. Following the identification of high potential artefacts the sample for analysis was refined to 28 pieces by consultation.

Table 2: summary of functional analysis

Of the selection for analysis, twelve artefacts show traces of wear, with one (SF0210) showing two different areas of wear (Table 2). The functions include use as projectiles, the processing of animal materials, plants and further uncertain attributions. Evidence for the use of projectiles is provided by the presence of Multi Linear Impact TraceS (MLITS) on SF0031 & 0059 (Figure 11). A small flake (SF0202) was used for scraping hide, this was probably a scraper edge rejuvenation, indicating on-site tool maintenance. Another flake (SF0445) and a blade/microlith fragment (SF0428) were used for cutting an unknown animal material, and a final flake (SF0388) for cutting soft animal material. Three artefacts were used for working plants: one blade (SF0210) being used to scrape a siliceous plant and the opposite side used for another plant material. A crescent and a blade (SF0067 and SF0343) were used to cut an unknown plant material. For the remainder of the pieces with wear the contact material could not be inferred.

Figure 11: A MLITS as seen on SF 0031 B Group of MLITS as seen of SF 0059 C Traces interpreted as those being the result of scraping hide on SF 0202 D Traces interpreted as those as being the result of cutting an unknown animal material on SF 445 E Traces interpreted as those being the result of scraping siliceous plants on SF 0210.

Spatial analysis of this functional data suggests some possible patterning to activity. The dangers of over-interpreting such a small number of artefacts are clear, but it is interesting that activities involving animal materials mainly took place to the south of the fire setting, most plant working (including SF0210 which was used on both edges) to the north.

Figure 12: basic distribution of artefacts with functional information. Orange indicates central burning feature

4.4. Trench Four – a synthesis

Combining these strands of evidence suggests that at some stage in the period 8161-8011 cal BP a small structure surrounding a fire setting was built on a gentle slope in a high valley, overlooking a waterlogged basin. Given its position on a prominent ridge, the location chosen is deceptively sheltered and out of sight (Figure 3). It is very likely that activity was seasonal although it is not possible to assess this with any detail. It is remarkable that activity at Caochanan Ruadha should lie so close in date to the '8200 cal BP event', a major period of climatic deterioration (Alley and Águstodóttir 2005) which would have had significant impact in these upland landscapes, as it is argued to have had in western Scotland (Wicks and Mithen 2014). Indeed it is possible that human activity in these uplands would, at times, have been undertaken in a glacial environment given that this event was much colder than the 'little ice age' of the last several centuries, for which there is evidence of glaciers in the Cairngorms (Harrison et al. 2014). There are currently no good data for the impact of the 8200 cal BP event at these altitudes in the Cairngorm and as yet, we cannot explore the relationship between this event and the human activities taking place at Caochanan Ruadha. The structure was probably set towards the upper margins of a pine-dominated open forest. It was presumably defined by poles or stakes and covered in hides, bark or other light materials and the building provided a space within which different tasks were undertaken. Within this structure there is evidence for artefacts that have been used as projectiles and used for processing different parts of an animal. It seems most likely that this means an animal was shot and (at least part of it) brought to the structure at Caochanan Ruadha. The animal was probably eaten: hide working is also evidenced, and the animal could have been utilised as raw materials for tools. The type of animal is unknown, but given the likely upland environment, it may have been elk (Kitchener 2010, for late survival of elk) or red deer rather than auroch or boar. Smaller terrestrial mammals (Kitchener et al. 2004) or birds are also possible. Plants were also utilised, but it is not possible to identify whether this was for food or craft activities in all instances. Some at least are likely related to processing of siliceous materials for craft. Retooling of lithic components of the tool kit appears likely to have taken place. These activities appear to have been comparatively limited in scope, and may have been very short lived. The hillside itself was visited on other occasions – the evidence from Trench Five suggesting a different form of activity taking place not long after the structure was used – and possibly at other times as well.

5. Mesolithic structures in upland Britain

Mesolithic structural evidence in Scotland is varied in character (Wickham-Jones 2004). Most structures have been identified by the presence of stake or postholes, artificial or natural depressions, fire settings, stone settings or (more ambiguously) flattened areas within middens. Structures vary from the substantial (c. 5 m in diameter) to much smaller (c. 0.5 m diameter). Rare evidence for structures in the uplands includes poorly understood stake holes and occupation soils at Starr, Loch Doon (Edwards 1996) and a possible post-built hut (c. 1.5 x 2 m) at Daer, Lanarkshire. Evidence for Mesolithic use of high mountain areas at Ben Lawers, Perthshire, has been disturbed by more recent activity and is not possible to interpret in terms of any structural features (Atkinson 2016).

Of the upland Mesolithic sites in Northern England, some in the Pennines are associated with evidence of structures (Spikins 2002) sometimes interpreted on the basis of artefact halos in association with varied structural evidence (Preston 2011/12, 2009). Stone settings associated with the edges of an oval hollow (c. 3.3 x 2.1 m at its widest) at Deep Carr, Yorkshire are interpreted as a structure, possibly opening to the South (Radley and Mellars 1964). Areas of cleared stone, stone settings and stakeholes indicate a burnt-down structure c. 5 x 3.3 m in dimension at Broomhead More Site 5 (Radley et al. 1974). At Dunford Bridge Site A the “abruptly-defined limits of the stones and the flint distribution is suggestive” (Radley et al. 1974, 7) of a c. 2.6 m diameter structure.

Setting aside comparative evidence for structures, to find microlith-dominated artefact scatters in the uplands of Britain is not unusual – indeed it has been the basis of a long standing model of upland small group hunting (Mellars 1976; Jacobi 1978). At Pule Bents in the Pennines a small scatter comprising 93 microliths (mainly rods and scalene triangles) and ten other lithics is argued to have been a location where stone tools were used but not manufactured (Stonehouse 1997): either a kill location (possibly used over some time) from which dead animals were removed or a cache of artefacts (as seen elsewhere in the Pennine uplands (Preston 2009). Other Mesolithic sites in lowland Scotland suggest very short lived, specialised activity, including a crescent dominated microlith assemblage from Fife Ness, associated with a small structure (Wickham-Jones and Dalland 1998).

7. Methodological Implications for Fieldwork

The interpretation of the presence of this structure is based solely on the distribution of artefacts, and in particular on their precise 3D location. This is not an unusual approach (Stapert 1989) but the precision with which we have identified the edge of the structure *solely* on the basis of artefact distribution is unusual, although, of course, artefact distributions have been used to identify different activity areas within and outside of structures (Conneller et al. 2012; Waddington 2007). Given the low numbers of artefacts, and the importance of the very sharp drop-off in lithic numbers in building the argument for the presence of a barrier, it is unlikely that gridded excavation would have provided the spatial resolution to identify this pattern

Given the importance of individual artefact location to our interpretation it is important to recognise the very small size of many of the artefacts. As noted above, the average maximum dimension is only 8.7mm. Only 30 artefacts from the site are >10mm in size. Recovering such small artefacts in difficult montane conditions is not straightforward, but has provided rich rewards. Fieldwork at Caochanan Ruadha had little logistical support in terms of facilities, not least because of the remote location. The excavation area was not covered, and there was little shelter from the elements. Many of the excavators were comparatively inexperienced students: many of them had limited experience of mountain environments and conditions. The significance of the spatial information recovered in these conditions suggests that further work in the uplands should seek to provide the best possible conditions for the conduct of excavation to maximise visibility of artefacts and recovery of spatial information.

8. Conclusion

Fieldwork at Caochanan Ruadha adds considerably to our understanding of the kinds of structures that remain to be found in upland and mountainous areas of Britain and of the various tasks that were carried out within or in association with them. As noted above, the use of upland and mountainous environments is a key aspect of Mesolithic activity in Europe, with recent overviews of Alpine settlement emphasising the “extremely high technical dynamism of the last hunter-gatherer-fishers and the variability of the adopted exploitation strategies” (Fontana et al. 2016, 3, and see other papers in this thematic issue of *Quaternary International*). Further, inter-regional comparative analysis of the use of the various uplands of Europe are required.

The structure appears to have been comparatively light and the limited range of tasks suggests that occupation was short term – perhaps little more than one night. The internal area of the structure is c. 5.2m^2 with a central fire. Comparative models suggest hunter-gatherer buildings have an average area of c. 5-7 m^2 per person (Belfer-Cohen and Goring-Morris 2013, 553), perhaps only one or two people were present.

The structure is but one focus of activity within a broader, low density scatter of worked stone and the full extent of the site has yet to be defined. Only one other concentration of activity has been dated, and although not contemporary it may not have been separated by any substantial period of time: initial analysis suggests that the activities that took place there may have been different. The Mesolithic use of the uplands of Britain in some places is characterised by the use of ‘persistent places’ (Barton et al. 1995), locales that see consistent patterns of activity over the long term. It is not clear yet whether Caochanan Ruadha is best interpreted in this light: the activities identified so far may have fallen within one human generation, and they may have varied over time.

The focus of activity in Trench Four shows that a small number of people were engaged in a limited range of tasks: processing animal carcasses, working plant materials, and, seemingly, repairing compound tools. They had carried materials with them to undertake these tasks: small flint cores to remove blades from and to manufacture microliths; a scraper; possibly twigs of yew for reasons we do not fully understand. It would be tempting to try and fit this into a simple model – to search for the 'reason' that Mesolithic hunter-gatherers were in this broad upland valley. Too often, models of the use of the landscape in the British Mesolithic have become narratives set around a pervasive lowland/upland divide, in which the motivation for activity in the latter is dominated by hunting large ungulates (Clark 1954; Mellars 1976). These models have been robustly critiqued (Spikins 2000; Finlay 2000) but should not be completely dismissed. Indeed, much of the evidence for activity at Caochanan would be coherent with a 'logistically' organised strategy of upland hunting with resources being taken back into lower lying areas of the landscape.

But this is not the only possible explanation. Even after detailed spatial, technological and functional analysis, it is difficult to identify the motivations of the people whose fleeting traces we have examined at Caochanan Ruadha. Yes, they hunted. But, they may have been journeying around the southern flanks of the Cairngorm massif because the Geldie Burn connects *via* Glen Feshie to the hills west of the Cairngorms; or they may have been seeking resources. More comparative data are needed to assess these questions, though the difficulties of site prospection in this region are substantial. Nevertheless, Caochanan Ruadha is one of a growing number of sites that provide significant evidence relating to the exploration of Mesolithic lives in the uplands of Europe.

9. Acknowledgements

The UDTP partners are grateful for financial assistance received from National Trust for Scotland, Aberdeenshire Council, Society of Antiquaries of London, Robert Kiln Charitable Trust, Royal Archaeological Institute and Tony Clark Memorial Fund. The functional analysis was supported by a grant from the UCD College of Social Science and Law. Many people have contributed to the success of fieldwork including colleagues and students from the University of Aberdeen and University College Dublin; in particular we would like to thank Joe Cull, Bernard Gilhooly, Niamh Kelly, Rowan Lacey, Mark Powers and James Redmond. Thanks to Conor McDermott for assistance with the artefact photography. This work would not have been possible without the support of the NTS Estate Manager David Frew and the Mar Lodge Estate team. We are very grateful to Paul Preston for discussion of upland Pennine comparanda. Thanks also to two reviewers for their useful suggestions for consideration.

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Figure 1: location map showing key sites mentioned in text. Boundary in black marks edge of Mar Lodge Estate

Figure 2: View across Geldie Burn to Caochanan Ruadha (red arrow) looking N.

Figure 3: View looking S, location of Trench 4 visible to left, Trench 5 in centre-left

Figure 4: GLD15, Tr 5. Mid Excavation, showing C.504, 505 & 506. C. 503 underlying Dark shading indicates main concentrations of charcoal in C.504. Red diamonds are flint artefacts. Refitting cluster SF507-510 in SW corner.

Figure 5: GLD15, Tr.4 & Tr. 4 ext. Post excavation plan. C.414 visible throughout trench. Fire setting C406/407 highlighted in tan. Test pits in pink

Figure 6: GLD14, post excavation view of pit C.406/407. Looking SW.

Figure 7: GLD15, Tr. 4. Mid excavation plan (bottom of Spit 2 of C.402) showing all flint finds.

Figure 8: GLD15, Tr. 4. Mid excavation plan (bottom of Spit 2 of C.402) showing all flint finds and possible structure.

Figure 9: a sample of microliths, mainly broken, recovered from Caochanan Ruadha

Figure 10: possible trace of resin on SF0306

Figure 11: A MLITS as seen on SF 0031 B Group of MLITS as seen of SF 0059 C Traces interpreted as those being the result of scraping hide on SF 0202 D Traces interpreted as those as being the result of cutting an unknown animal material on SF 445 E Traces interpreted as those being the result of scraping siliceous plants on SF 0210.

Figure 12: basic distribution of artefacts with functional information. Orange indicates central burning feature

Table 1: Caochanan Ruadha: C14 determinations

Table 2: summary of functional analysis

Figure 1

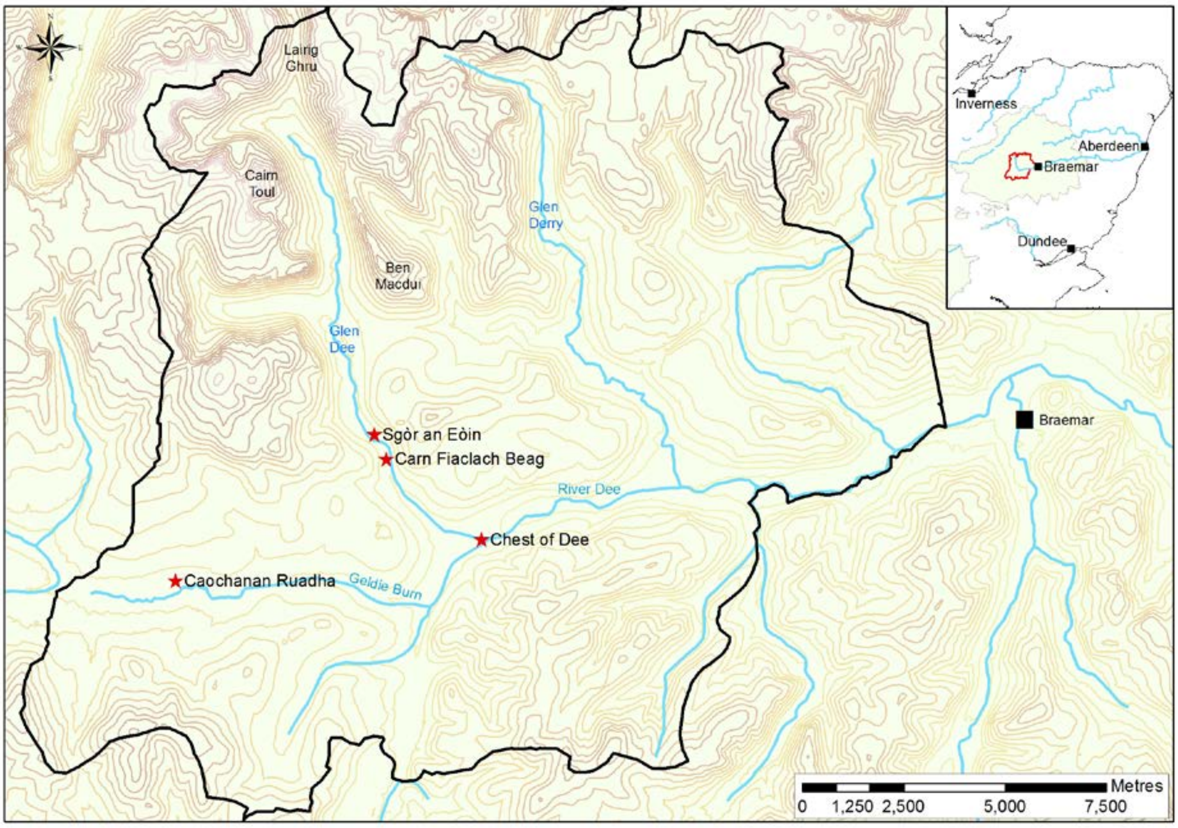

Figure 2

Figure 3

Figure 4

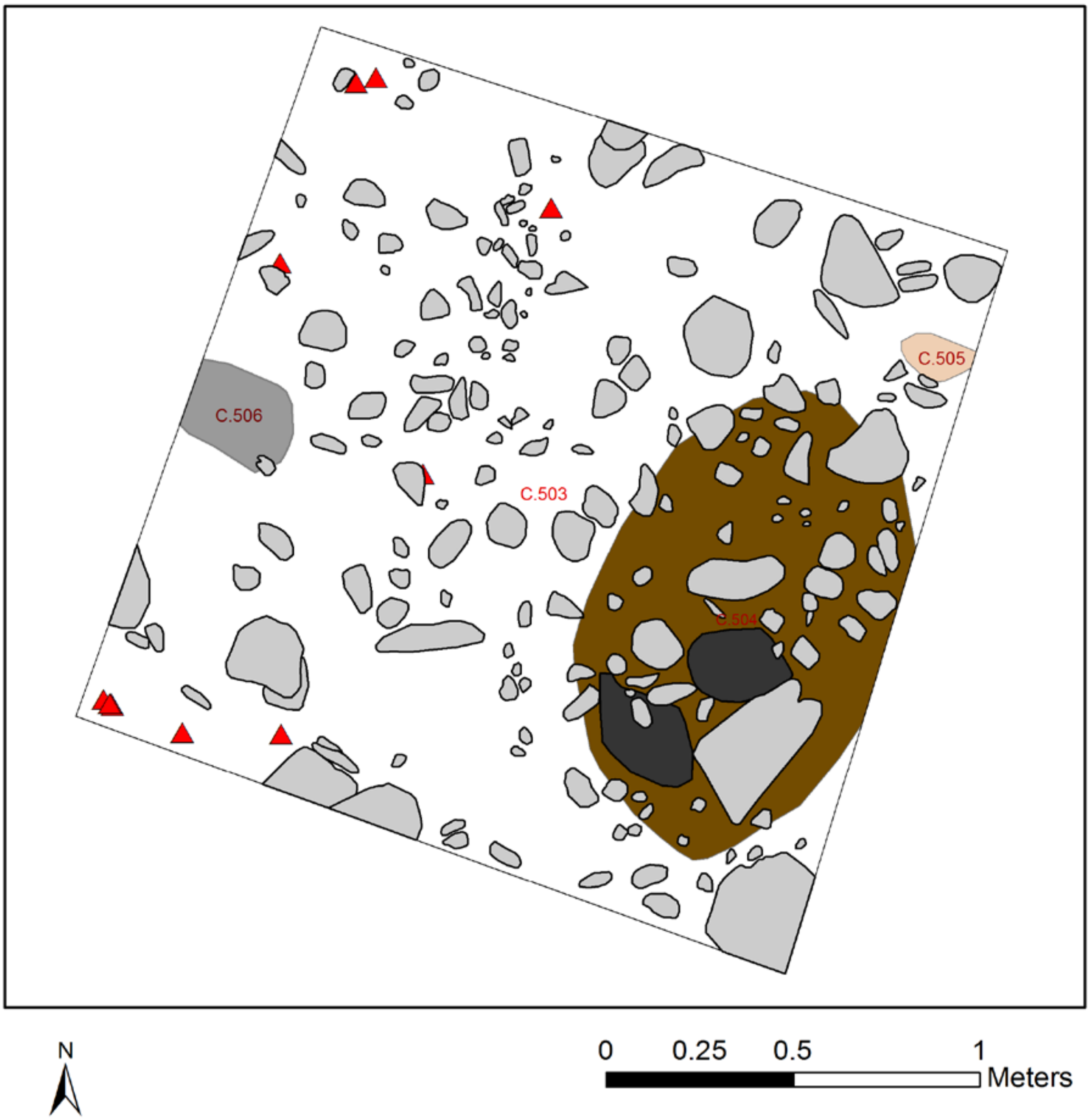

Figure 5

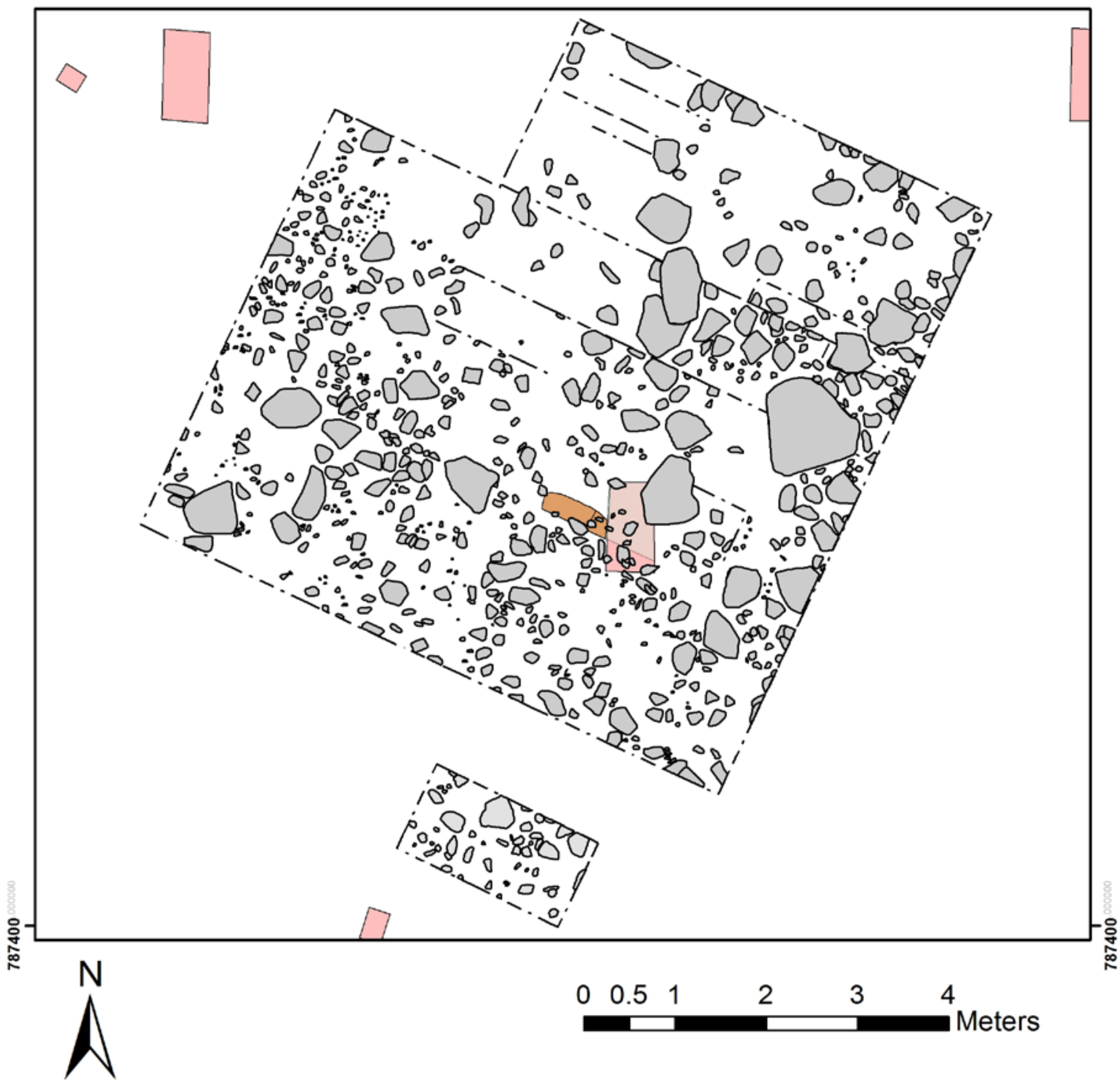
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Figure 6

Figure 7

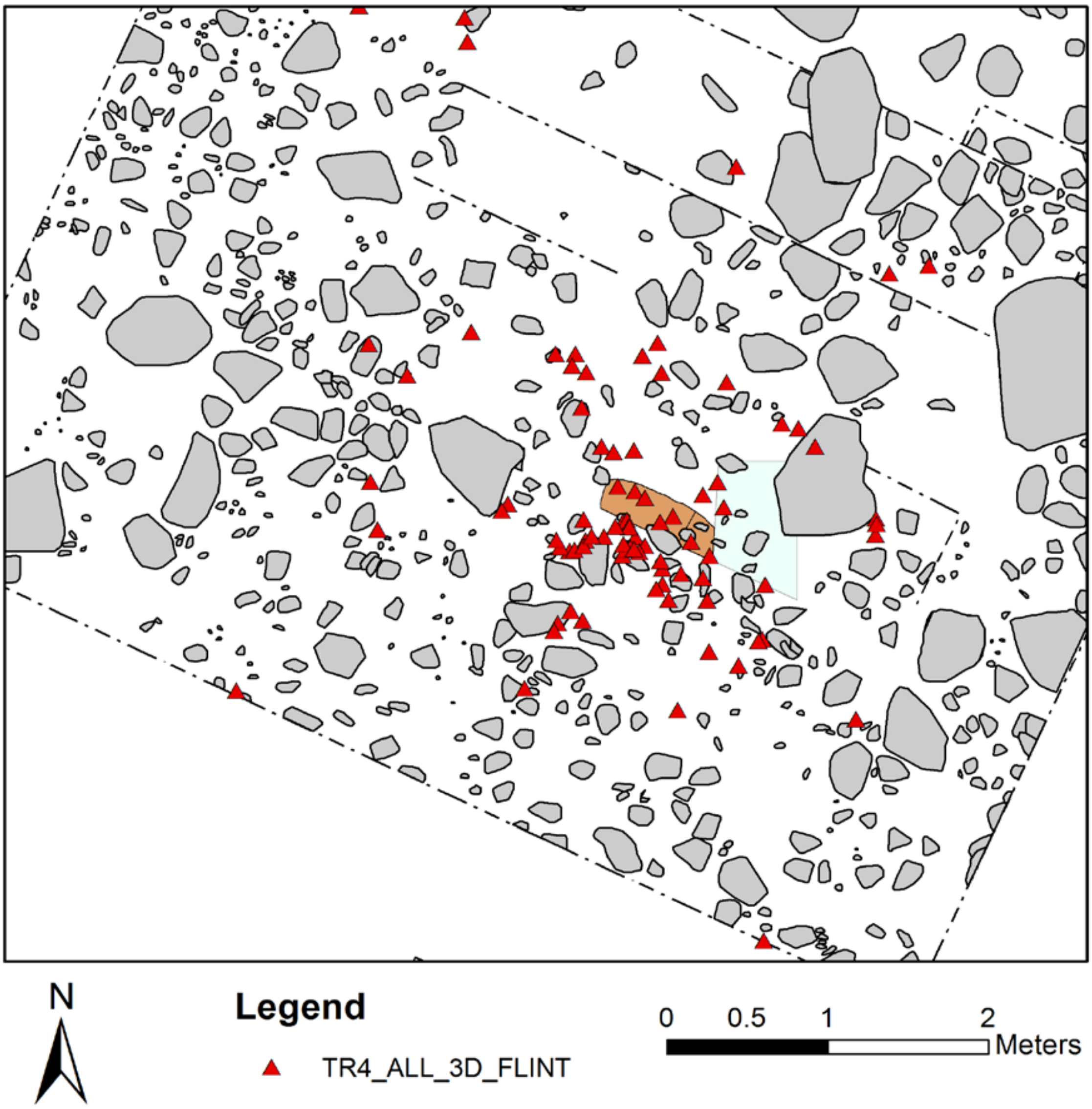


Figure 8

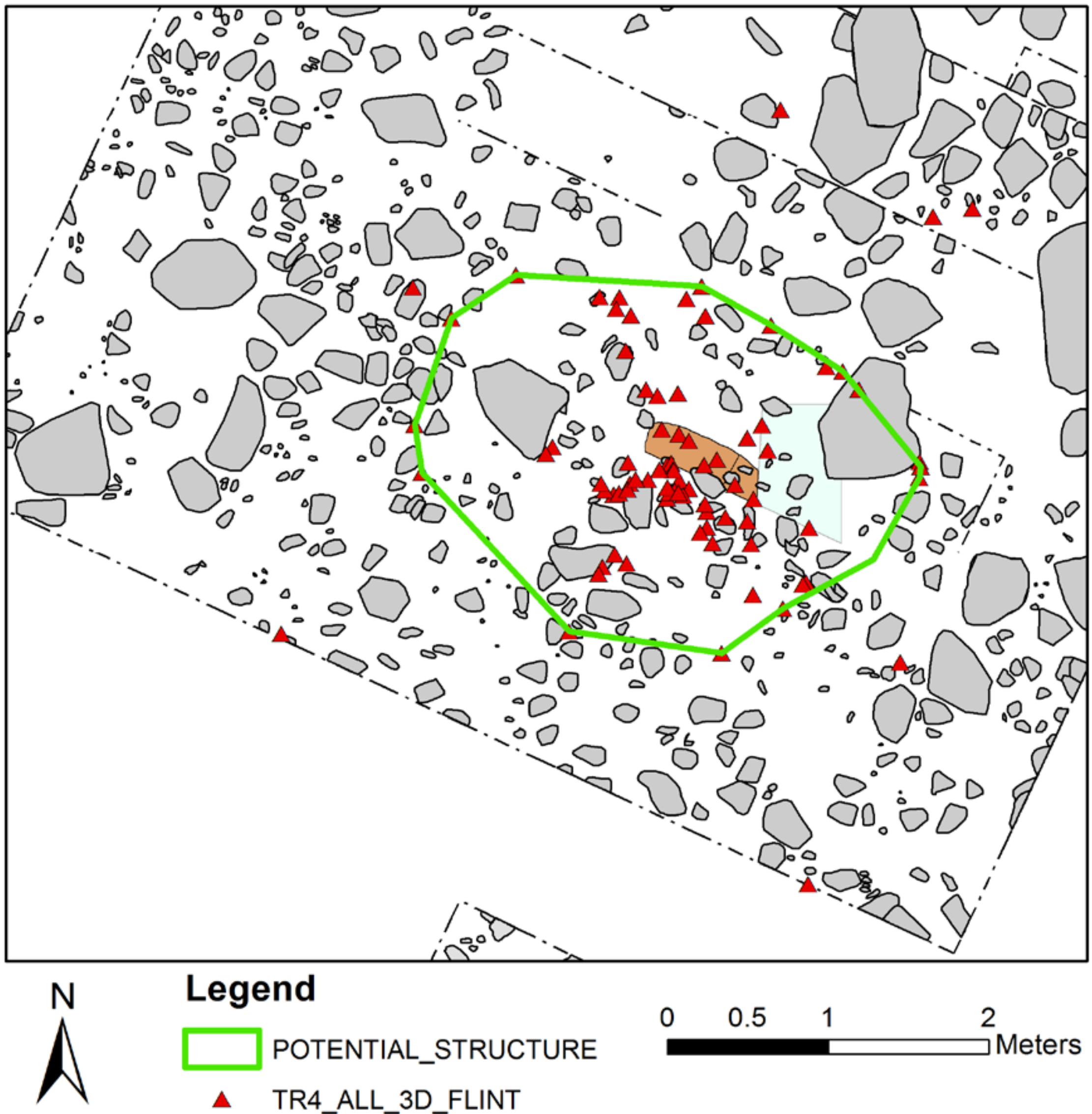


Figure 9

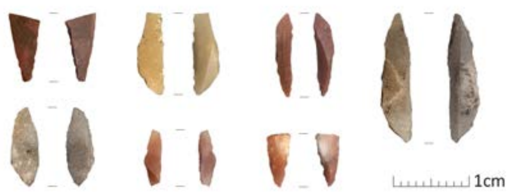


Figure 10

Figure 11

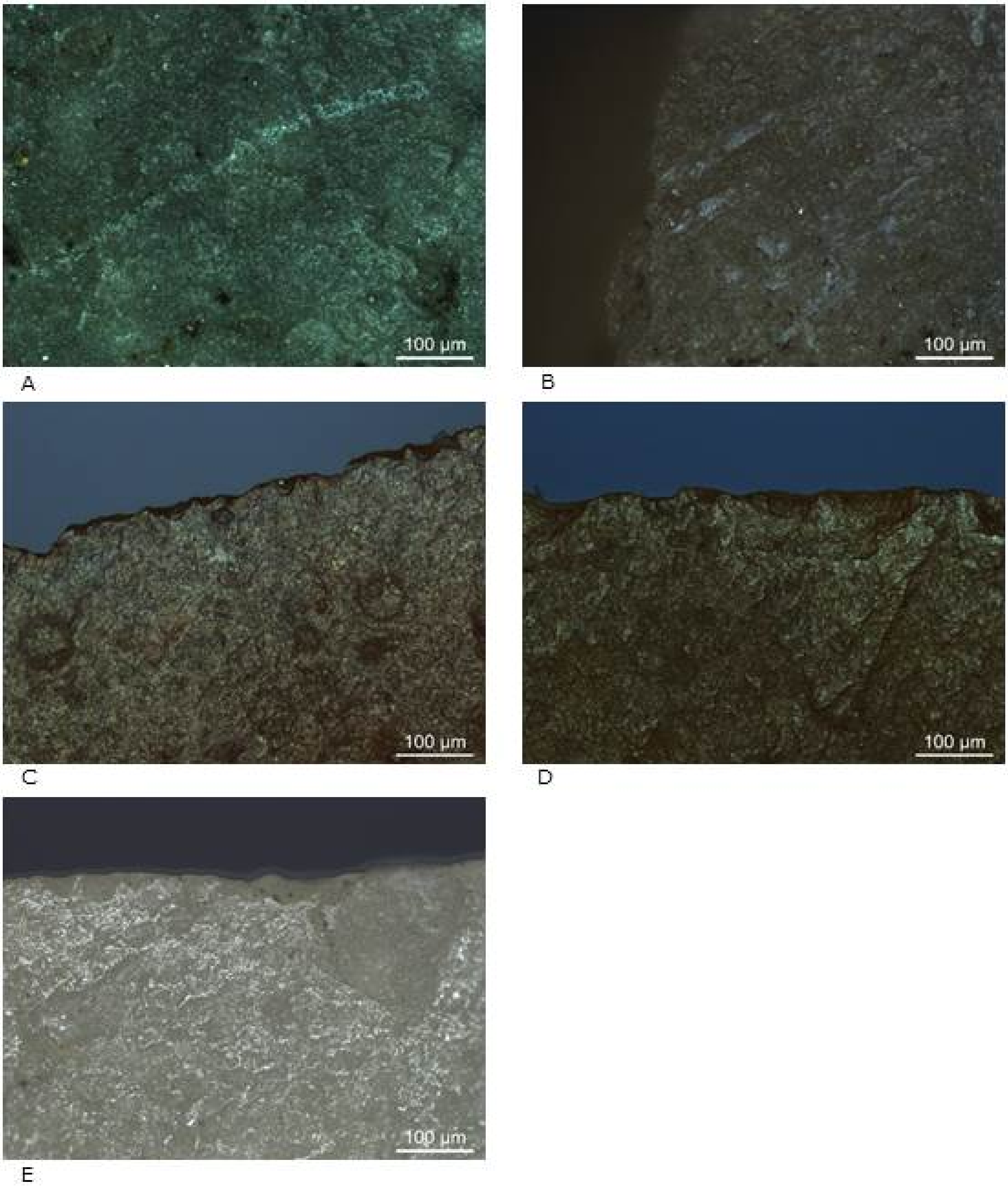
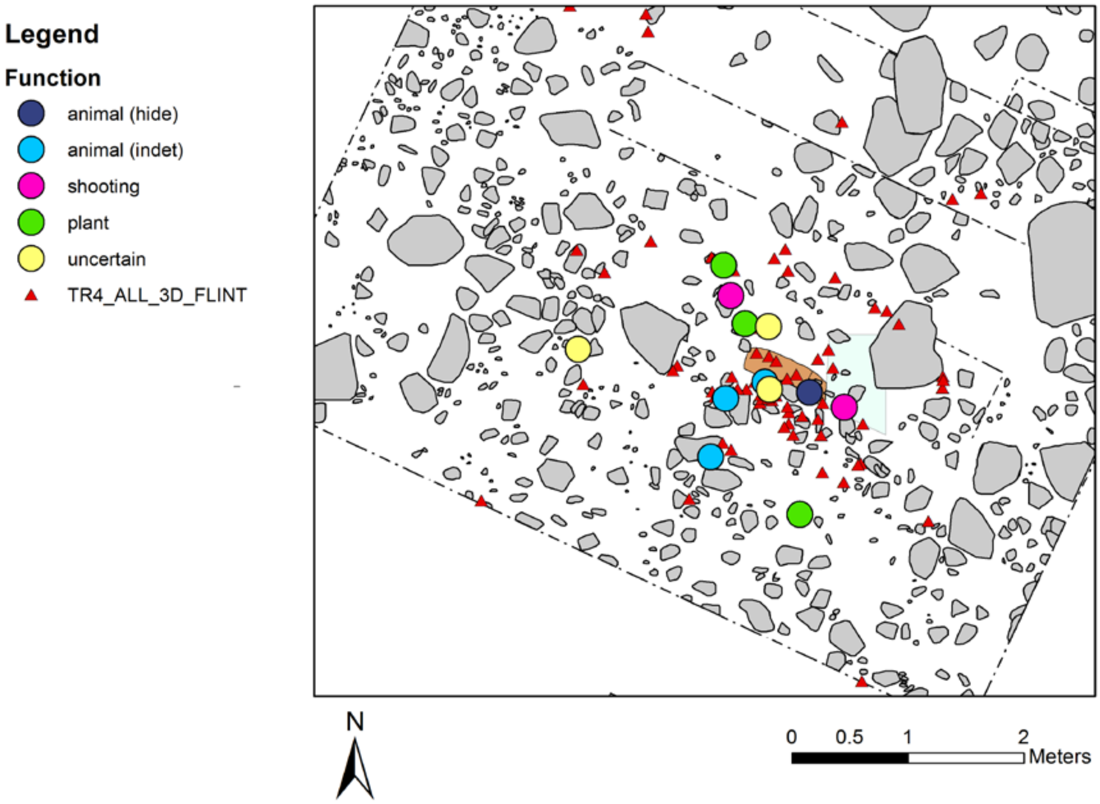


Figure 12



Supplementary information: Caochanan Ruadha radiocarbon dates

R Schulting

As discussed in the main text, radiocarbon dates on short-lived charcoal samples from each of the two trenches at Caochanan Ruadha were successfully combined using the 'R_combine' function in OxCal 4.2 (Bronk Ramsey 2013) (Figure S1). The dates from two trenches, however, fail the ☐ test (df=3; T=8.3(5% 7.8)) (Ward and Wilson 1978), suggesting that they refer to different events. The 'Difference' function in OxCal 4.2 was used to model the interval between the combined dates for Trenches 4 and 5. The results indicate that, while there is a small probability that they were partly contemporary, it is much more probable that the activities represented were separated by at least some decades, possibly by as much as ca. 165 years (-8 to 164 years, 95.4% confidence), though more likely no more than a century or so (-4 to 87 years, 68.2% confidence) (Figure S2).

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Figure S1. Plot of combisned dates for Trenches 4 and 5 at Caochanan.

Figure S2. Modelled difference between combined ^{14}C dates for Trenches 4 and 5 at Caochanan.

Figure S1

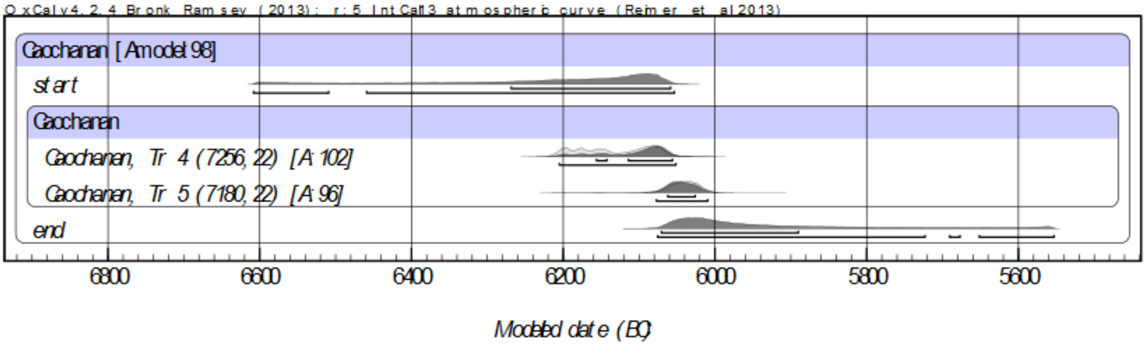
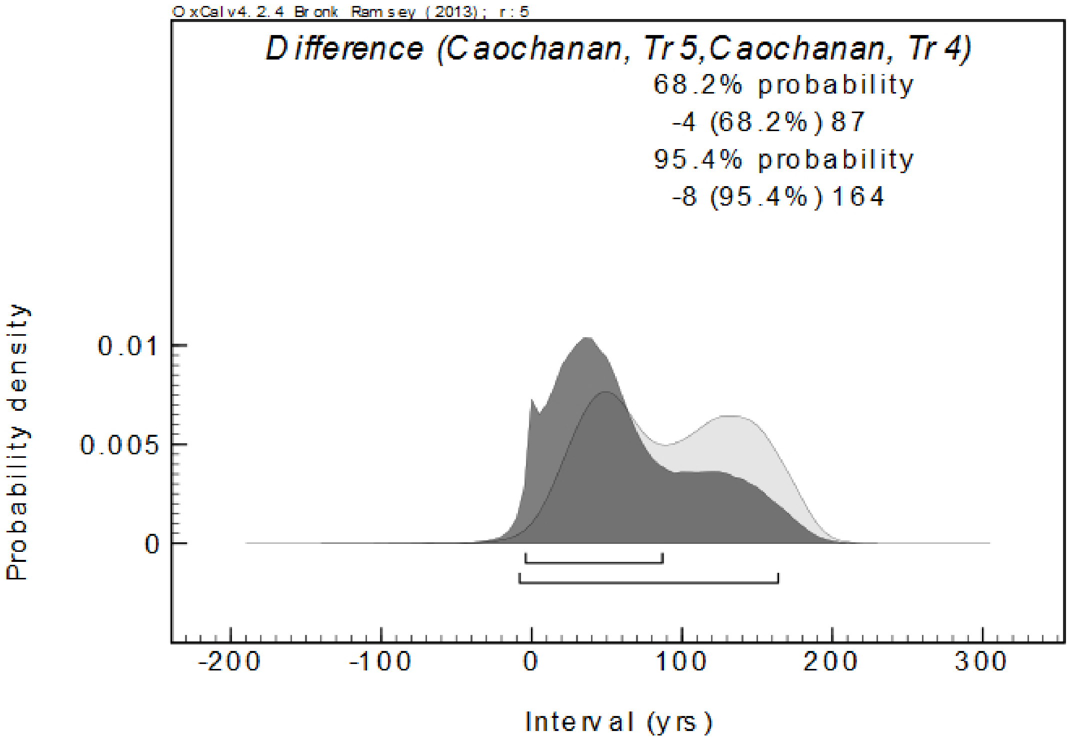


Figure S2



Use wear analysis on 28 flint artefacts of the Caochanan Ruadha excavations

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November 2016

LAB - Rapport 49

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1. Introduction

Several flint objects from the Coacachan Ruadha excavations were selected for use wear analysis. After an initial pilot study 28 pieces were analysed at the Leiden Laboratory for Material Culture Studies. The first selection was made by G. Warren, the final selection was made in consultation between A. Verbaas and G. Warren. Even though the entire assemblage was affected by post depositional processes which hampered the analysis, the selected pieces proved to be good enough to be studied. Thirteen pieces showed traces of wear, displaying an array of activities.

2. Preservation, selection and methods

Of the total body of objects found at Coachan Ruadha a first selection for use wear analysis was made by Graeme Warren. The preservation of all these artefact was assessed (Garcia Diaz 2015 and Verbaas unpublished) and of the total body of 86 artefacts, 32 were deemed good enough to be analysed. Another 29 artefacts were deemed less suited, but were classified as 'analysis still possible". The remainder of 25 artefacts was categorised as 'unsuitable for analysis'.

The relative high number of unsuitable pieces is the result of the presence of a considerable amount of post depositional modifications that complicate and hamper the visibility of use-wear traces. The entire assemblage displays a light surface abrasion, probably caused by the contact of the implements with sandy sediment. In addition, some pieces demonstrate a lightly developed white or coloured patina. Subsequently some of the artefacts were burned. All these alterations have affected the pieces on different levels and the final recommendation for use-wear was made based on these traces. It should be noted that all artefacts are affected and even the pieces that were in a good enough state to study are suffering from post-depositional modifications.

Both the assessment and the final analysis were conducted using a Nikon Stereomicroscope with a 10-64x magnification and a Leica DM6000M metallographic microscope with incident light and magnifications between 100-200x. The pieces were assessed based on the surface quality and modifications for the visibility and preservation of use-wear. During the analysis the Stereomicroscope was used in order to assess the morphology of the tool and to detect possible residues. The metallographic microscope was used to allow an interpretation of the wear traces. For an extensive description of the methodology see for example the studies of Van Gijn (Van Gijn 1990, Van Gijn 2010).

3. Results

Of the 28 pieces analysed for use-wear 12 show traces of wear on a total of 13 locations. However, the absence of traces on the other pieces may not be interpreted as the result of a lack of activities: if artefacts are used for a brief period only, or on very soft materials, use-wear may not develop sufficiently enough to be distinguished.

On two microliths, both fragments of the tip, possible traces of shooting were seen: The ventral surface of SF0031, a microlith tip fragment, displays two zones of Multi Linear Impact TraceS (MLITS), normally interpreted as a function as projectile. These zones with MLITS each show a slightly different directionality (fig 1a), which complicates the interpretation. Especially as MLITS may also be the result of scratching of sand grains during sieving or excavation (see for example Lammers-Keijsers et al 2015). Another explanation is that the piece was used as the tip of an arrow and was fired twice, resulting in MLITS with two directions. There is however no experimental reference for this theory. Microlith tip fragment SF0059, displays a group of MLITS as well (fig 1b). These are positioned in a slightly obtuse angle away from the tip. The MLITS are visible on the dorsal side. At the start of these MLITS a small edge damage was removed from the ventral side. Both the directionality and the distribution of the traces indicate on a high level of probability that the fragment was used for shooting.

SF number	Type	Interpretability	Degree of Wear	Motion	Contact material
31	microlith fragment tip	traces	probably used	shooting	unsure
35	microlith fragment medial	no traces			
37	blade	no traces			
57	microlith scalene	no traces			
59	microlith fragment tip	traces	probably used	shooting	unsure
64	microlith scalene	traces	light	boring	unsure
67	microlith crescent	traces	light	diagonal cutting	plant
85	microburin	no traces			
202	debitage indet	traces	medium	scraping	hide
203	microlith fragment medial	no traces			
210	blade	traces	light	unsure	plant
210	blade	traces	medium	scraping	silicious plant
231	blade	no traces			
244	microlith fragment tip	no traces			
252	microlith fragment tip	no traces			
254	microburin	no traces			

305	blade	traces	probably used	hafting	unsure
343	blade	traces	light	longitudinal	plant
387	debitage indet	notrac			
388	blade edge retouched	traces	medium	cutting	soft animal
409	debitage indet	no traces			
428	microlith fragment indet	traces	light	unsure	medium animal
430	microlith fragment indet	traces	medium	unsure	unsure
435	microlith fragment indet	no traces			
443	microlith fragment indet	no traces			
445	flake	traces	medium	longitudinal	animal
448	microlith possible	no traces			
452	microlith fragment indet	no traces			

Table 3: Overview of the results of the use wear analysis

Four pieces were used to work an animal material. A small flake (SF 202) or fragment shows traces of scraping hide at the distal end. The polish is greasy with small, round, unpolished areas or pits (fig. 1c). The edge is damaged and very rounded. Based on the shape of the artefact, the location of the traces, the distribution and the development of the traces this could very well have been a flake that was removed from the edge of a scraper during use or reworking of the edge. A fragment with edge retouch was used to cut a soft animal material and the piece was broken during or after use (SF 388). The ventral edge is highly rounded but shows hardly any edge damages, while the dorsal edge is highly damaged and the polish is formed all over the edge, including the depths of the retouches. The polish is the result of working an soft animal material in a longitudinal direction, but the exact contact material is unclear.

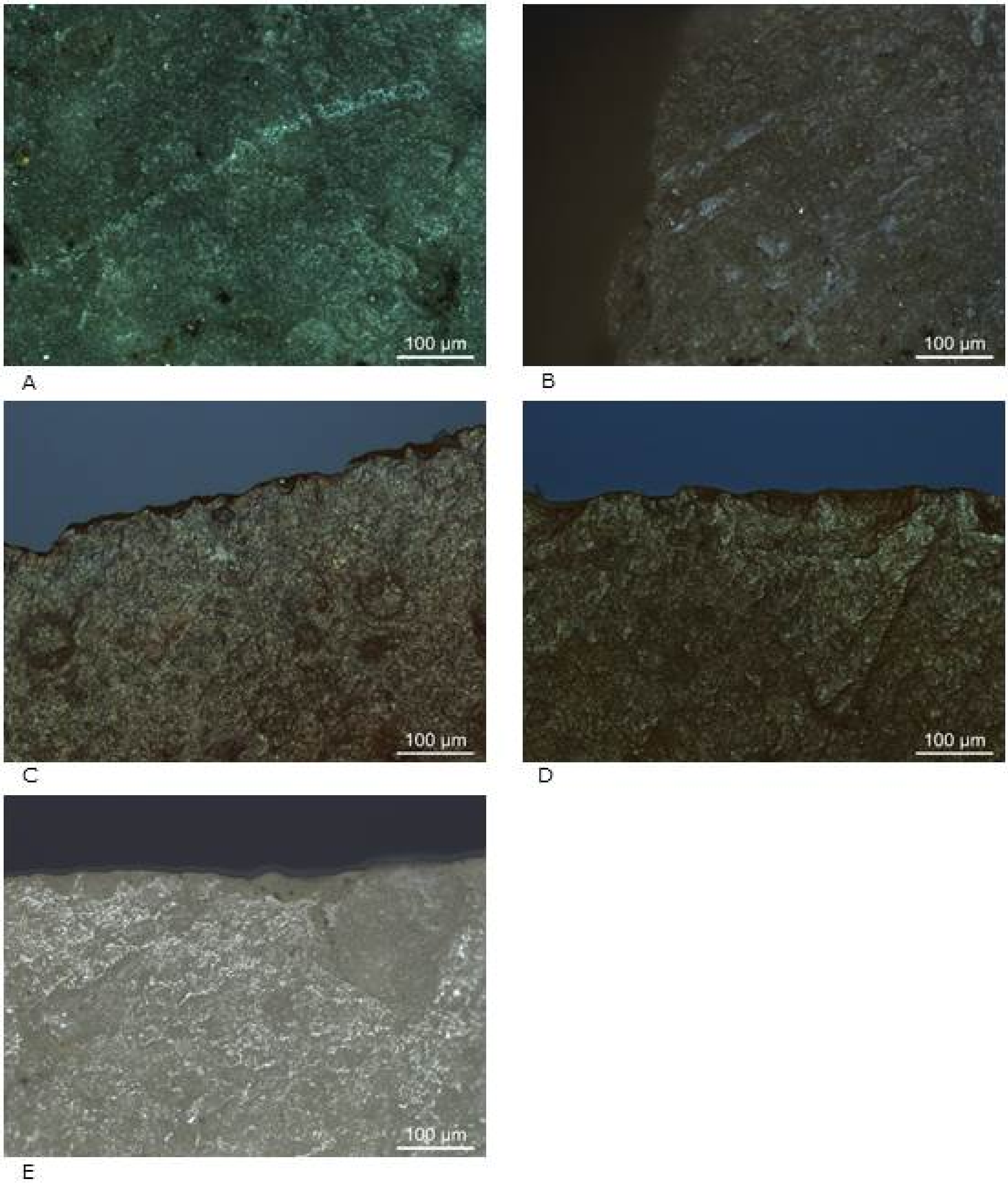

Figure 1 A MLITS as seen on SF 0031 **B** Group of MLITS as seen of SF 0059 **C** Traces interpreted as those being the result of scraping hide on SF 0202 **D** Traces interpreted as those as being the result of cutting an unknown animal material on SF 445 **E** Traces interpreted as those being the result of scraping siliceous plants on SF 0210.

A third piece with traces of working an animal material (SF 0445) was probably turned over during use. On the distal end the traces are better developed on the ventral side, while on the proximal end they are better developed on the dorsal side. The piece was used to cut an unknown animal material. The edge is lightly damaged and a band of polish is visible along the entire edge (fig. 1d) combined with a lot of edge rounding. A final piece, a blade/microlith fragment (SF 0428) was used to work on animal material. Unfortunately the traces are only lightly developed on a very small spot, making it impossible to further specify the material worked.

Three pieces were used to work plant material. First of all a blade (SF 0210) was used both to scrape siliceous plants (fig. 1e) and to work an unknown plant material with the opposite lateral edge. A second piece , a crescent (SF 0067), was used to cut an unspecified plant material. Based on the directionality visible in these traces the object was probably hafted with an 30 degree angle. The third object, blade SF 0343,was also used to cut an unknown plant material. The polish had formed in a broad band with several edge damages resulting of use. These edge damages are stacked on top of each other and there is no edge rounding visible, indicating a relatively hard material.

On two edges that displayed traces the worked material was unclear, but the used motion could be inferred. One piece was used to drill an unknown material (SF 0064). The tip at the proximal end of this tool is highly damaged by retouches and in between these retouches some polish is visible. Due to a relatively high level of post depositional wear on this piece the traces were not interpretable. The other piece, a blade (SF 0305), was originally possibly hafted, based on traces seen around the bulb. These traces are only lightly developed and heavily disturbed by post depositional wear, making it hard to interpret them with certainty. Finally one microlith fragment (SF 430) was clearly used, as there was a small spot of polish visible at the tip of the tool (fig. E). The spot was however too small to be interpreted.

Interpretation of traces

Animal materials form the main group of worked material (N=4). One piece was used to scrape hide and the other tools were used on animal materials of various hardness. Additionally probable shooting traces were seen on two pieces. This combination of traces related to animal processing suggests that an animal was shot and brought to camp to be processed.

Of the three pieces with traces of working plant materials only one could be attributed to a certain task, the scraping of siliceous plants. These traces of siliceous plant are commonly observed on Mesolithic and early Neolithic flint tools, mainly blades (see for example Odell 1978, Peeters *et al.* 2001, Van Gijn *et al.* 2001a, 2001b, Noens *et al.* 2011, Niekus *et al.* 2014). The tools that display these traces are generally intensely used and a high percentage of these tools are found per site. It is therefore an activity that is commonly executed for long durations of times. Several theories have been formed for the activity that causes these wear traces and it is genearlly assumed that this is a craft related activity (ao Peeters *et al.* 2001) even though the gathering of food has also been briefly suggested, but immediately rejected as well (for example Van Gijn 2010). Several experiments have been performed with both edible plants as for example rhizomes and plants that can be used for basketry or from which fibers can be extracted.

After these experiments the exact activity remains unclear, but the scraping of for example grass or Juncus produces traces that are close to the archaeological traces (Van Gijn 1990, 2010). Based on these experiments the traces seem to be the result of a craft related activity. On the Coachan Ruadha tool these traces are relatively lightly developed, indicating a short term use for this particular activity. The other traces of plant working could not be further interpreted. These tools can be used for anything from gathering/preparing food to processing plants for basketry.

If we look at the activities carried out with the different tool types (table 2 and 3) we see that traces of shooting (N=2) were seen on the fragments of tips of microliths. These microliths were probably broken inside the haft on impact and therefore had to be replaced. As the fragments were quite big it seems likely that they were still stuck inside the haft but too loose to reuse. Or that the tip remained in the body of the animal and was removed at the camp or stayed inside the carcass and was left at the site. The other microliths were used for a variety of materials and were probably hafted during use. All blades were used on plant materials, with the exception of the retouched blade, which was used to cut a soft animal material. One of the unretouched blades was hafted as well.

In conclusion, it can be stated that, apart from the three blades used to process plants and the microliths for shooting, there does not seem to be a preference for a certain tool type for a certain activity. The microliths were used for a wide variety of tasks. This is a common phenomenon in Europe (Siebelink et al., 2012, Odell, 1978, Dumont, 1988), although some studies display a predominant use of microliths for shooting (Crombé, Perdaen, Sergant, & Caspar, 2001, Noens et al., 2011, Mazzucco, Gassin, Gibaja, & Palomo, 2012).

	flake	blade	blade edge retouched	microlith crescent	microlith scalene	microlith fragment tip	microlith fragment indet	debitage indet	**total**
hide	-	-	-	-	-	-	-	1	**1**
soft animal	-	-	1	-	-	-	-	-	**1**
medium animal	-	-	-	-	-	-	1	-	**1**
animal unspec.	1	-	-	-	-	-	-	-	**1**
silicious plant	-	1	-	-	-	-	-	-	**1**
plant	-	2	-	1	-	-	-	-	**3**
shooting	-	-	-	-	-	2	-	-	**2**

unsure	-	1	-	-	1	-	1	-	**3**
total	**1**	**4**	**1**	**1**	**1**	**2**	**2**	**1**	**13**

Table 4: Material worked versus tooltype

Even though there are only 12 pieces with traces of use wear, there is a spatial distribution visible (Figure 2). The pieces used to work animal materials are clustered south of the central fire setting in the centre of the possible structure while the plant working tools were used further away from the fire.

	flake	blade	blade edge retouched	microlith crescent	microlith scalene	microlith fragment tip	microlith fragment indet	debitage indet	**total**
boring	-	-	-	-	1	-	-	-	**1**
cutting	-	-	1	-	-	-	-	-	**1**
diagonal cutting	-	-	-	1	-	-	-	-	**1**
hafting	-	1	-	-	-	-	-	-	**1**
longitudinal	1	1	-	-	-	-	-	-	**2**
scraping	-	1	-	-	-	-	-	1	**2**
shooting	-	-	-	-	-	2	-	-	**2**
unsure	-	1	-	-	-	-	2	-	**3**
total	**1**	**4**	**1**	**1**	**1**	**2**	**2**	**1**	**13**

Table 5: motion used versus tooltype

Unfortunately not many Mesolithic sites in the UK have been analysed for traces of wear. The only assemblages submitted to use wear analysis are Starr Carr (Dumont 1988 and Robson et al 2016), several Upland sites in Scotland (Finlayson 1989) and Glean Morr (Finlayson and Mithen 1997. But as the sites are generally much larger and contain many more flint finds or were analysed using different methods (using only a stereomicroscope) , a comparison of the use of flint artefacts does not seem valuable.

A site that we can compare this site with is the site of Sumar in the Netherlands (Verbaas in prep). The analysis and publication of this site is in process at the moment, but several scatters of flint have been excavated. The sites date to the late Mesolithic and although the variety in tool types and the amount of pieces retrieved is slightly higher than for Coachan Ruadha, the site is interpreted as being used for a short duration. In the concentrations of Sumar a wide variety of tasks was performed, with an emphasis on the scraping of silicious plants. These results are comparable to the Coachan Ruadha site, where the duration of occupation seems even shorter and therefore the variety of wear traces observed is smaller.

Conclusions

Of the 28 tools analysed for micro wear 12 show traces of wear. The tools have been used for shooting, scraping hide, working unknown animal materials, cutting plant materials and indeterminate activities. The traces of working animal materials seem to be clustered south of the central fire setting while the plant working tools are more dispersed an generally further away from that area. Based on this combination and distribution of traces it may be suggested that this was a short term camp where shot animals were processed. During the stay in this camp other activities were executed as well. The plant working traces may be interpreted as the gathering of food or the execution of repairs of perishable items. Especially blades were used for this activity. For the other tasks there does not seem to be a preferred tool. The wear traces indicate a short term used location where the main activity was hunting.

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